

How to Cite:

Amirtharaj, S., & Selvamani, V. (2022). Medicine sales management system with user-friendly dashboard and long term client relationship support. *International Journal of Health Sciences*, 6(S3), 1814–1826. <https://doi.org/10.53730/ijhs.v6nS3.5807>

Medicine sales management system with user-friendly dashboard and long term client relationship support

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Abstract---The Unified Modeling Language (UML) is a standard modeling notation used for modeling systems for which computer applications are to be developed. The objective of this system is to design models for a Medicine Sales Management System using the UML. Modeling and implementation are done with the goal of improving the user-friendliness of the Dashboard and supporting long term customer relationship by using different modules like Deals, Contacts and others. In this system, the people interested to buy medicines and surgical equipments are considered as leads and they become contacts of the system. A profile is created and provided to them. Then the system let them know the product details and the deals available for the medicines. Once they purchase a product, the contacts become customers. The customer can easily manage their profile and view their activities through their dashboard. The medicines are sold using the system and tracked similar to scheduling the calls. The tracked data are stored and maintained. Users can view the purchase details of the customer like the type of medicine and quantity purchased.

Keywords---medicine, modeling, object orientation, sales management, systems development.

Introduction

The purchasers include wholesalers, retailers, distributors and some serving as agents for bigger companies and organizations. Every economy put limits to what size and scope of business can be described as a small or medium scale enterprise (SME) (Bennett et al., 2011, OECD, 2017). A small scale enterprise is a business firm employing not more than nine persons, while medium and large scale enterprises comprise firms employing ten or more persons. Another definition for a small scale enterprise is given by the National Board for Small Scale Industries as a firm employing not more than ten persons and the value of whose fixed assets are not more than ten million Rupees. In this paper, we consider pharmacy shops as a business entity employing not more than ten persons, whose scope does not go beyond a given locality (Town, village or region) and its data processing may not require more than four computer systems installed with Microsoft Access, Oracle and any other proprietary software applications.

While a few of the pharmacy shops find the existing medicine sales management systems (SMS) to be problem-free and a key to their continuous growth, most of them have quit using these systems after a while for various reasons. The opinion of those who discontinued the computerized systems is either that, the systems were slowing down their daily sales or that they were too complex and expensive to use. Some users continue to use the systems as they do not know about any available alternate system. It is important that the wide spread availability of information and communication technologies should enable every willing business to find an appropriate solution to its particular problems among the various solutions provided. However, it is not uncommon to overlook some of the challenges SMEs like pharmacy shops in developing countries still grapple with when it comes to sales management. While some businesses have had their problems solved by using computerized systems, others have to bear high cost if they wish to meet their sales target with the systems they wish to or are currently implementing. The common challenges faced by the SMEs include misrepresentation of sales, loss of goods and profit, high cost of sales tracking, customer dissatisfaction, difficulty implementing marketing strategies, and high cost of acquiring software licenses.

Though some of the challenges listed above have been tackled by various computer applications and sales management systems, many SMEs are still confronted with them. One for this problem is that most of the existing solutions have not been created to provide the information that most of the SMEs need to keep their businesses going. In summary, the challenges with the existing systems include high cost of acquiring full software packages, special hardware requirements of some functions, systems not satisfying unique goals of SMEs, requirement for understanding some accounting principles, and the cost of paying for extra functions that are not needed. The objective of this paper therefore is to design and develop a better sales management system for pharmacy shops. The specific objectives of the work were to: design an easy to learn and use sales management system suitable for SMEs; build a prototype which can be used as a model for future projects; reduce cost of employing Information and Communication Technology (ICT) in SMEs; expose SMEs to the usefulness of ICT

to their business processes; make ICT more adaptable and appealing to entrepreneurs of SMEs within the region; help SMEs introduce more formalized sales transaction procedures into their businesses; and help SMEs maximize profits through a more effective sales and stock tracking system.

The functioning of various leadership styles are analyzed in (Tedla & Vilas, 2022). Comparison of the approaches, merits and demerits are also discussed. A survey of public health databases and the findings of the role of leadership in the health departments toward early prevention of COVID-19 is presented by (Bangkara et al., 2021). A review of the significance of the UML in modeling systems effectively and the use of UML models in various phases of software development is discussed in (Alhumaidan, 2012). A web application that presents user-friendly Dashboards for all stakeholders of a higher education institution is presented in (Amirtharaj et al., 2022). The system encompasses features for getting necessary inputs and presenting various reports and visualizations required for the institution that follows outcome based education and choice based credit system.

Parents can login and view the details of their ward like academic progress, awards and achievements including the co-curricular and extra-curricular activities. In addition to the reports needed for the students and parents, reports required for the audit and accreditation processes can also be generated by the system. A review of the practices followed by the Halal Food Supply Chain (Almelaih & Omain, 2022) in the United Arab Emirates is discussed in literature. The impact of the system on consumer perceptions, trust and satisfaction are also discussed. Attainment of better organizational capabilities by effectively identifying the capabilities of employees and giving the right job to the correct person using the Building Information Model (Kumar et al., 2022) has been presented in the literature. An analysis on the utilization of the factors like professional skepticism, workload, and whistle blowing on fraud detection is done using an empirical approach by Haris et al. (2022).

Materials and Methods

The proposed system is designed and implemented using the object oriented software development approach (Bennett et al, 2011, Jeya Mala et al, 2013). This approach is an iterative process. It is easy to identify system components, locate and fix bugs quickly with very little effect on other components and allows better reusability of the design and modules. The user requirements were elicited through interviews with selected pharmacy shops. This helped to define the needs of the target users, which are selling medicines and surgical supplies. Selected pharmacy shops in nearby towns were used as case study since the most commercial and profitable SMEs are located in these towns. Also, to accommodate the ever growing nature of businesses, the project sought to create a solution which will be easy to upgrade through further developments to meet future needs of businesses.

In line with object oriented systems development approach, the Unified Modeling Language (UML) is used to design static and dynamic models. The use case diagram designed for the main modules provide an outline for overall system implementation. The software used for developing this project is PHP and Angular

JS 11 using Visual Studio code. This software combination is object oriented and event driven and makes it easy to design interactive and user friendly graphical user interfaces (GUI). It is also convenient to use along with the Microsoft Windows Operating System which is the preferred choice of the target users. This guarantees that many of the libraries needed to run the system will be available on the user PC, making it cheaper to use the system. As an Information system, the sales management system runs with a Microsoft Access 2007 database at the back end to help collect, store, process and retrieve data for its users. As mentioned in the previous section, this system is not intended to be a final release. It serves as a prototype and a basis for further developments and enhancements as the data needs of SMEs increase.

Requirements analysis and system design

The Requirements analysis was done to ascertain the type of sales management systems used by the SMEs and users experiences with the existing systems. This process led to the identification of two major types of systems namely; manual systems and computerized legacy systems. In response to questions about which of the two types of systems was preferred, most of the businesses using the manual systems where daily sales books are maintained chose the computerized systems as most effective and convenient but cited factors such as difficulty of use, cost of acquiring full package and technical functions as reasons for not using them. It was also noted that some of the users of computerized systems also kept daily sales books, explaining that their sales persons needed a more formal training to be able to use the system effectively and for that matter it was convenient to keep a daily sales book to help identify error entries and sales misrepresentations. The more comfortable users of computerized systems were mostly users with a fair accounting knowledge. In some cases business owners left the entire system to the accountant who was more familiar with the system, a situation in the opinion of some poses a business risk.

Inferences from the requirements analysis show that ease of use and knowledge prerequisite are the main reasons why most SMEs are not able to adopt computerized systems fully for tracking and managing their sales processes. This situation makes them stick to old practices and sometimes inefficient methods of tracking sales. The effect of this is loss of profits due to poor record keeping. Hence we sought to build a sales management system with user friendly and interactive GUIs which are easy to learn and use. However, the design does not compromise the security or integrity of business processes, and is intended to streamline transactions to eliminate user level errors such as misrepresentation of sales, unfound transactions and error entries.

Main system components

The system is divided into three main components (classes) each of which has its own sub components (subclasses) which carry out various functions. These components are the Entry component, Administrative component and Point of Sale (POS) component.

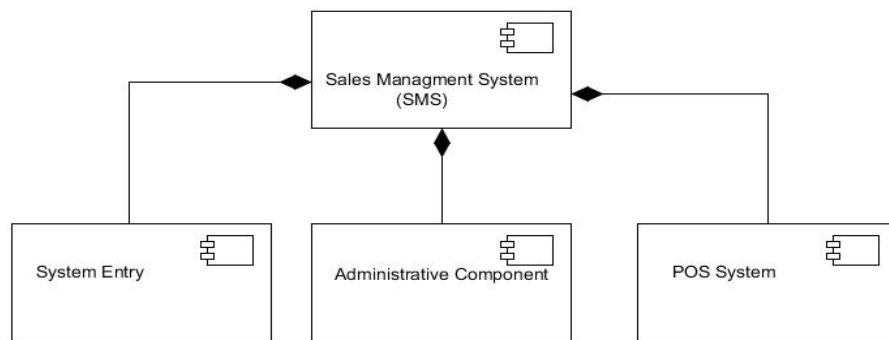


Figure 1. Component Diagram

Component diagram

The Component Diagram is presented in figure 1. The system has a fourth component which provides a user manual and system documentation, which is meant to guide a user through some task and can also be used as a training manual. It is not treated as a main component of the system because its design and implementation is done independent of the project. The next section decomposes the main components and gives their detailed structure and designs.

System entry component

The system entry component is the first part of the system every user interacts with before undertaking or carrying out any other activities. It is composed of the main program background frame, the login frame and the system main menu. The background frame is the parent of all other frames within the system. It provides the initial controls needed to start up any other process within the system. This frame calls up the login frame which calls the main menu frame, after successful user authentication. The main menu frame provides GUIs that have associated commands for connecting to the other components of the system. The classes are implemented in a hierarchical manner. This class hierarchy is illustrated in figure 2 which show the typical activities at the entry point of the system and also a simple sequence of events that directly involve this component.

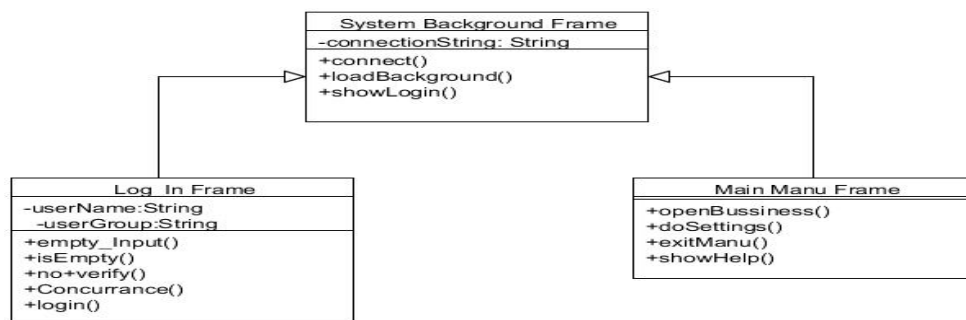


Figure 2. Class hierarchy of system entry component

Use case model

Use Case is an interaction between the actor (user) and the system (application). For a single system, there may be many use cases depending on the requirements. A use case model for the Administrator view of the system and another use case model for the POS system are illustrated in figure 3.

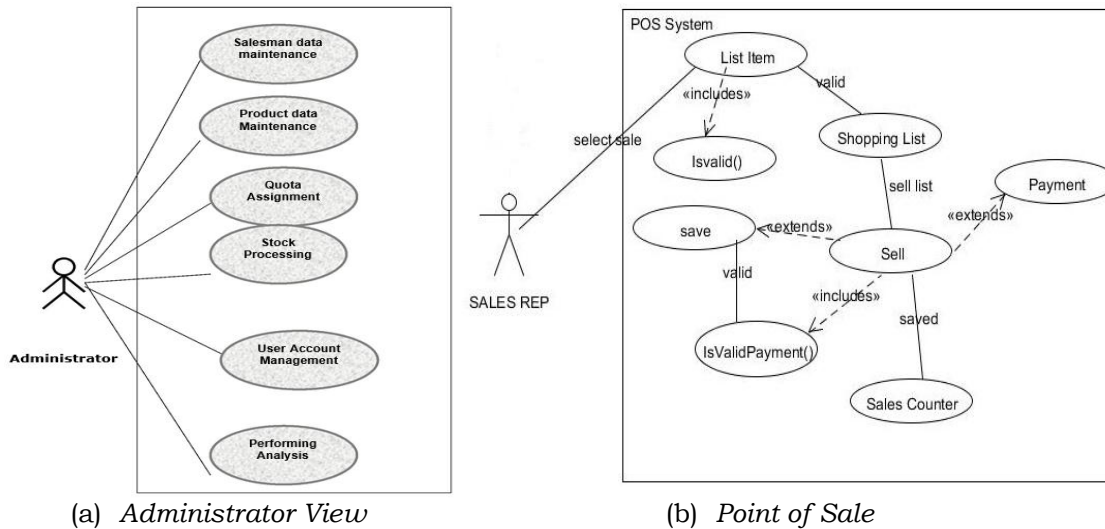


Figure 3. Use case diagrams

Activity diagram

The business process is modeled using the activity diagram. It is a dynamic model which illustrates all the possible major activities of the overall system. This model shows in detail, how the user will execute commands at the entry level and the effect or functions that calls up the responses or events as a result of a given action. The activity diagram for the proposed system is presented in figure 4.

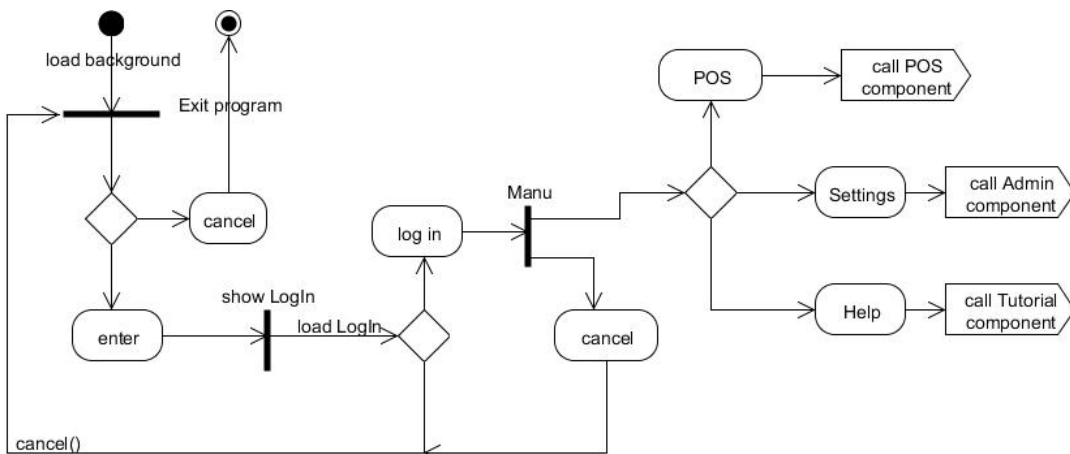


Figure 4. Activity Diagram

Sequence diagram

The sequence diagram focuses on the sequence of events that occur in each use case. Figure 5 presents the sequence of events that occur during user interaction with the system entry component.

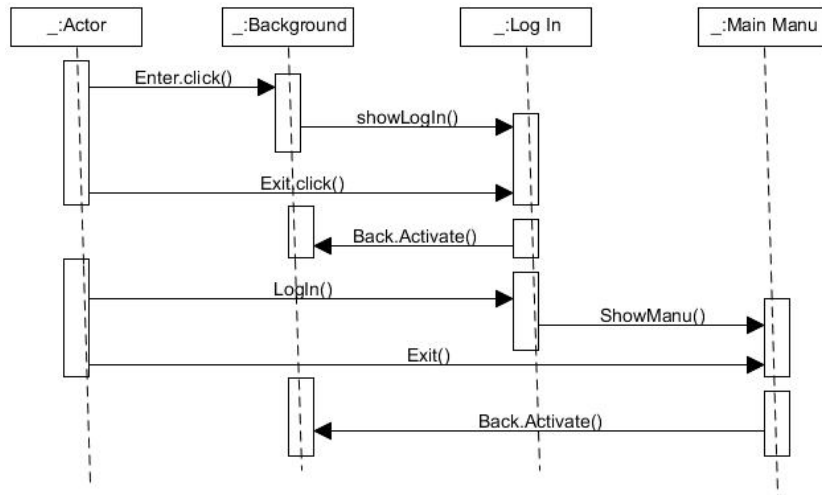


Figure 5. Sequence Diagram

Administrative component

The administrative component is also called settings in this project. It is the largest component within the system; it includes several functions for monitoring and controlling or defining which functions a user can call up at any point in the system. Each component defines a set of functions which carries out the task related to the component.

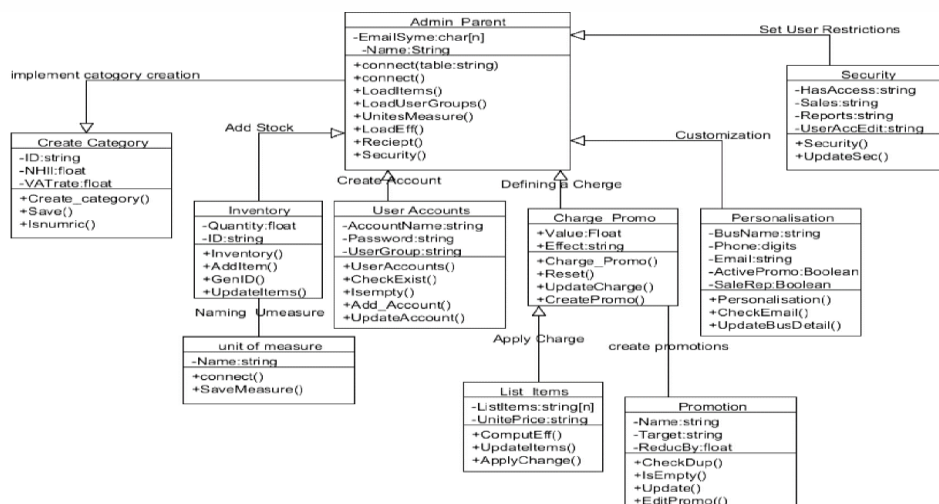


Figure 6. Class Diagram for Administrator View Layer

The administrative component illustrated above implements most functions related to the creation or assignment of resources defined by the system. Some of the functions include; creation and editing of user accounts and stock categories, adding inventory, defining charges and promotions and creating new units of measure. Figure 6 presents the class diagram of the administrative component which shows how the individual components are related and interconnected.

Point of Sale Component

The Point of Sale (POS) system is the point where most of the data handled or processed by the sales management system are generated. It therefore includes a number of data input fields and data storage procedures to ensure effective tracking. The POS also includes some administrative features such as; the activation of charges and promotions and also their deactivation, Viewing and printing reports and commission administration. The functions available to a user at the POS system are determined by the user group and rights; any user at the POS can conduct sales, however only administrators can access the administrative functions available. Figure 7 presents the class diagram of the POS component.

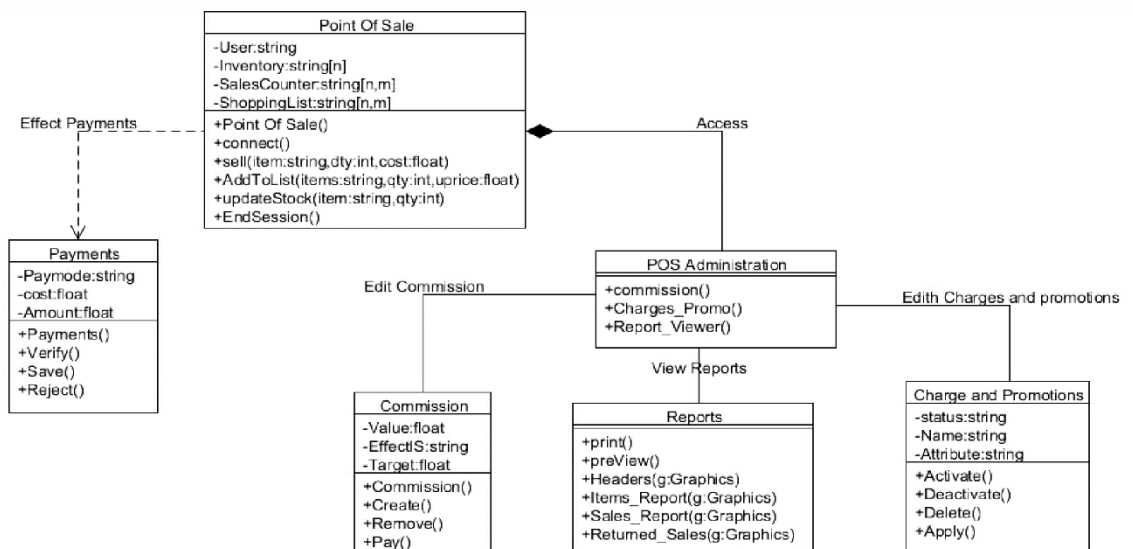


Figure 7. Class diagram of POS

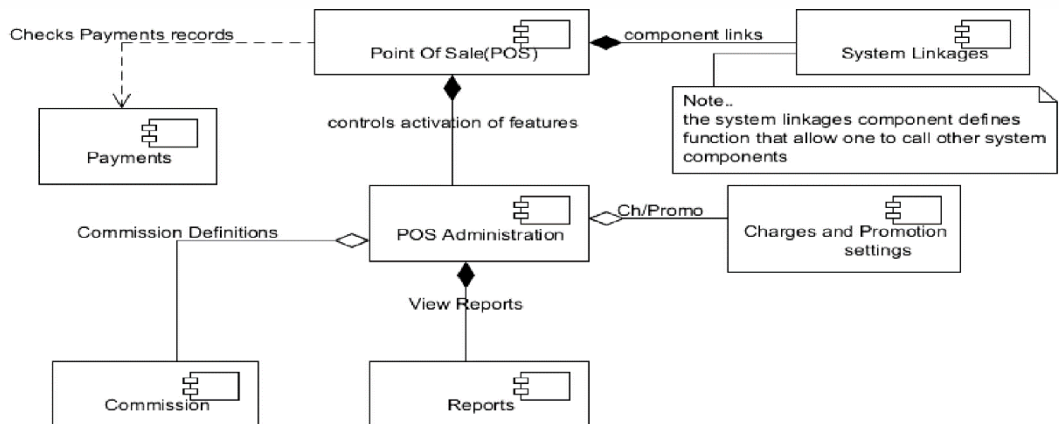


Figure 8. Component Diagram of POS

Figure 8 illustrates the component diagram of the POS system. The system links component represents functions that links or connects the POS system with the other components of the system i.e., this component allows a user at the POS system to switch to any other component. The payments components has a special relation with the POS system called a dependency, the relationship as shown on the diagram illustrates that the payments component is only triggered by the changes of events at POS system i.e. if no sales transaction occurs there is never going to be any instance of the payments component. Another special relationship can be seen at the POS administration component, this relationship shows that commission and the charges and promotions components are not an integral part of the POS administration and therefore can be implemented independently of it. A class diagram can be used to show in details of the linkages and relations that exist between the components and also show the features of each component.

Results and Discussions

The background frame sets up the environment for the given system. This includes loading business details and the custom background which identifies the business. A user at this point can make a login request by clicking ENTER or CANCEL to terminate the program. The login frame requires the user to supply data for identification and subsequent validation by calling `validate_User()` method which calls the `Login()` method when all conditions for a valid login are satisfied. Some conditions that may lead to a login fail include: database exceptions, concurrency, and invalid password.

Administrative component

This component embodies six other components for performing a number of administrative functions. They include: stock categories, inventory, user accounts, security, personalization and charges and promotions. The stock categories component allows the administrator to define inventory classes which

make it easier to analyze and apply changes to inventory in the same class. The component also allows you to edit these classes.

Point of sale component

At the POS a user is provided with various controls to effect and keep track of sales. Some of the controls include a sales counter to keep track of the day's sales while business is going on and the shopping list which temporally holds the list of items a customer wishes to purchase. Sales can only be restored by the sales representative who made the sale and during his/her session on the day of sale if access is granted. Administrators can make such changes at anytime during their sales session. Items in the shopping list can be removed or their quantity changed. POS administration component provides some administrative functions which include commission, reports and charges and promotions. These functions are placed in the POS system for easy access and also as means of motivating sales personnel. The commissions component allows the administrator to create or add users to the commission list, this component is however not a core part of the POS system. It is therefore implemented as a separate component and then linked with the POS system. This is true also for the charges and promotions component. Commission is computed on a daily basis when the user logs off using the logoff menu option. The charges and promotion components allow the user to activate or apply charges or promotions which were created in the administrative component.

The system links component allows a user to access and interact with other system components. It is implemented as a set of menu options, which grants access to a given component based on the user group and access level, defined in the security component of the administrative component. Some links include; Main menu, search and view. Payments component provides options to allow the user view payment status and to clear payments made in other modes other than cash payments. Some screen shots of the system are shown in Figures 9-12. Figure 9 shows part of the user interface in the Create Contact Module. Figure 10 presents part of the user interface in the Create Lead Module. Figure 11 shows part of the user interface in the Create Deal Module. Figure 12 presents part of the user Dashboard displayed by the system.

Home

Leads

Contacts

Accounts

Deals

Tasks

Meetings

Calls

Reports

Create Lead

CancelSave and NewSave

Lead Image

Lead Information

Lead Owner

Company

First Name

-None-

Last Name

Title

Email

Phone

Fax

Mobile

Website

Lead Source

-None-

Lead Status

-None-

Industry

-None-

No. of Employees

Annual Revenue

\$

Rating

-None-

Figure 9. User interface for create lead module

Home

Leads

Contacts

Accounts

Deals

Tasks

Meetings

Calls

Reports

Create Contact

CancelSave and NewSave

Contact Owner

Selvamani Veeraiya

Lead Source

-None-

First Name

-None-

Last Name

Account Name

Vendor Name

Email

Title

Phone

Department

Other Phone

Home Phone

Mobile

Fax

Assistant

Date of Birth

MMM D, YYYY

Pipeline

-None-

Asst Phone

Stage

-None-

Email Opt Out

☐

Closing Date

MMM D, YYYY

Skype ID

Figure 10. User interface for create lead module

Create Deal

Cancel Save and New Save

Deal Information

Deal Owner: Selvamani Veeraliya

Deal Name:

Account Name:

Type: -None-

Next Step:

Lead Source: -None-

Contact Name:

Plan1:

Amount: \$

Closing Date: MMM D, YYYY

Pipeline: first

Stage: Qualification

Probability (%): 10

Expected Revenue: \$

Campaign Source:

Figure 11. User interface for create lead module

Welcome Selvamani Veeraliya

is my work

All Leads

formal z	tcs	mmathan325_ca@mepcoeng.ac.in	09944490046
test 1 m	test2	selvamaniveeraliya@gmail.com	(994) 449-0046
ag	test		
sec record	chennai	mmathan325_ca@mepcoeng.ac.in	00887766554
new lead	chennai		
madhu heloo	mepco	mmathan325@gmail.com	09944490046

< 1 to 10 >

All Deals

Deal Name	Amount	Stage	Closing Date	Account Name	Contact Name
madurai	\$ 100.00	Closed Won	Feb 19, 2022	King (Sample)	
madurai	\$ 100,000.00	Closed Won	Feb 9, 2022	mepco	
most	\$ 200,000.00	Closed Won	Feb 23, 2022	madurai	
most	\$ 10,000.00	Closed Won	Feb 24, 2022	demo	
King	\$ 60,000.00	Identify Decision Makers	Feb 1, 2022	King (Sample)	Kris Marri (Sample)

< 1 to 10 >

All Contacts

Contact Name	Account Name	Email	Phone	Contact Owner
win m	wip			Selvamani Veeraliya

Figure 12. Dashboard

Conclusion

The success of any system is dependent on its usage. The ultimate goal of any software development project is customer satisfaction. It is therefore hoped that the system will be used under conditions that satisfy its requirements. Given the required maintenance, the system will help facilitate sales management of

medicines and surgical supplies. The system provides a user-friendly dashboard. It provides support for long term client relationship by offering features like tracking and storing relevant data needed for effective sales management. The system also offers good visualization, reports and business intelligence insights.

Acknowledgments

The authors are grateful to their affiliated institution for providing excellent infrastucure for academic and research activities. They are also grateful to the anonymous reviewers for their valuable comments that were highly helpful in improving the quality of this paper.

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